NOTES BY THE EDITOR.

CLIMATE AND VEGETATION—REQUEST FOR DATA.

Some years since the present editor of the WEATHER REVIEW was ordered to compile an official report embodying whatever is known with certainty from experiment and observation on the subject of the influence of the weather on vegetation, and especially on our important crops. He is now revising his preliminary report of June 30, 1891, on this subject. An important part of this study consists in comparing the weather with the dates of budding, leafing, flowering, setting, and ripening for each species of plant, and he desires to make his collection of phænological data for America as complete and exhaustive as possible. The readers of this REVIEW will confer a favor by sending to the Weather Bureau references to records of American phænological observations and studies, whether printed or manuscript, of old or modern dates, by themselves or by others. As a check against overlooking the manuscript records of the older meteorological observers, many of which are preserved either in Washington or elsewhere, the editor would be especially grateful for reference to their papers. Those who have rare old periodicals, newspapers, almanacs, etc., containing the desired data which they are willing to loan may be assured of their safe return in a short time. Those who desire to enter upon a series of observations of this class will be furnished with the necessary instructions by the Chief of the Weather Bureau.

DATES OF FIRST KILLING FROSTS.

Dr. J. C. Neal, director of the Experiment Station, Stillwater, Okla., states that in that Territory, owing to the long drought, Kafir corn did not begin to bloom till September 25, and that if it is frosted before the seed is ripened, both forage and seed will be lost; it is therefore desirable to know when the first killing frost may be expected, as the corn must be cut for forage if it has not time to ripen before frost. The following is a list of such dates as the Weather Bureau has on record. The earliest frosts in surrounding States have occurred as follows: Southern Kansas, October 20; southwest Missouri, October 9; western Arkansas, October 4; northern Texas, October 14. But frost is not a matter that can easily be anticipated from such statistical data; it is evident that in Oklahoma frost comes later than in Missouri and Arkansas on the east, or in Kansas on the north, and is not likely often to occur until within ten days after those sections have been visited.

Indian Territory.—Anadarko, 1892, October 9; 1893, October 13. Fort Supply, 1890, September 30; 1891, September 25; 1892, October 8; 1893, October 13. Gwenndale, 1893, November 14. Healdton, 1890, December 7; 1891, October 7; 1892, November 9. Jimtown, 1889, November 2. Lehigh, 1892, November 18; 1893, October 27. Pauls Valley, 1892, October 24; 1893, October 27. Purcell, 1892, October 24; 1893, October 27. South McAlester, 1891, October 1; 1892, November 9.

Oklahoma.—Buffalo, 1892, October 14. Burnett, 1892, October 10; 1893, October 15. Fort Reno, 1889, October 26; 1890, November 3; 1892, November 6; 1893, October 29. Fort Sill, 1879, November 18; 1880, December 1; 1881, November 3; 1882, November 29; 1884, November 19; 1885, October 21; 1886, October 27; 1887, October 27; 1888, October 3; 1889, November 9; 1890, November 3; 1892, October 25; 1893, November 12. Gate City, 1893, October 8. Guthrie, 1890, November 26; 1891, October 7; 1892, October 25. Keokuk Falls, 1892, October 25; 1893, October 16. Kingfisher, 1892, October 24. Mangum, 1892, November 10; 1893, October 27. Ponca, 1892, November 17. Sac and Fox Agency, 1892, October 8. Winnview, 1893, November 12.

THE AURORA OF AUGUST 19–20, 1894.

On August 19 and 20 the principal area of high pressure that passed southward from Hudson Bay during the month reached the Lake region, Missouri and Ohio valleys, and notwithstanding the extensive areas of smoke that then prevailed, numerous observers witnessed the brilliant aurora that accompanied this high area. As usual there was also an extensive system of telegraphic ground currents. One of the few areas of 20° fall in temperature during this month, i. e., area "D," occurred at this time.

A remarkable feature of this aurora was the fact of its visibility in Texas, South Carolina, and Tennessee, notwithstanding the bright moonlight. So far as can be judged from the few reports here given it began to be visible on the 19th at about 10.30 p. m., seventy-fifth meridian time (which is that required to be used in all Weather Bureau work unless otherwise specifically mentioned), in the Rocky Mountain plateau. By 1.10 a. m. of the 20th it had become visible at St. Vincent, Duluth, and Columbia, S. C., and a little earlier at Knoxville and Abilene. By 1.20 a. m. or 2 a. m., it had become visible in northern California and eastern Washington. The following accounts have been received from regular Weather Bureau observers:

Abilene, Tex.—20th, an unusual spectacle in this latitude was observed this morning in the way of aurora. Noticed at 12.40 a. m., it continued with varying intensity till 3 a. m. It consisted of a broad zone of rose-tinted light above a dark segment whose altitude was 10°. There were streamers and white beams and a tremulous motion.

Baker City, Oreg.—19th, aurora observed from 10.30 p. m. to midnight, consisting of a bright luminous arch, extending halfway up to the polar star and directly thereunder at the highest point of arch. No streamers observed. Clear weather.

Columbia, S. C.—20th, an aurora of light was observed by persons up at 1.10 a. m., of a reddish purple color of varying intensity, fading and flashing at intervals. It apparently was of strong electrical energy, as it interrupted the workings of telegraph lines in all directions. The observer did not see the phenomenon, and has not been able to get a complete description of it or of the time of its beginning and ending.

Duluth, Minn.—20th, aurora observed at 1.10 to 1.30 a. m. White luminous beams rapidly changing in position and number, in azimuth 90° to 170°. At 1.20 a. m. a few of these extended from the horizon to the zenith, and at this time a pink glow appeared at altitude 40° to 60°, azimuth 80° to 100°, and continued visible about one minute.

Havre, Mont.—20th, an aurora began at 4 a. m., and ended at dawn. The aurora was of a white color, patches of cirro-stratus clouds prevailing here and there in the sky. At 5 a. m. there was an auroral corona, a union of beams south of the zenith, the aurora still retaining the white color. The beams or streamers would disappear and reappear after a short interval of time of from three to five minutes; at 5.30 a. m. patches of luminous haze of a reddish color appeared in the northwest. The aurora extended fully 60° south of the zenith at 5.40 a. m. At times during this display the wires in the telegraph office could not be worked. There was no auroral arch visible during the display. The azimuth of the aurora, west end, was about 40°, east end 320°.

Helena, Mont.—19th, an aurora consisting of a pale yellow light and shooting beams was observed at 9.50 p. m. The shooting beams, which were of a deep orange color in the west and yellow in the east, extended to the zenith. At 10.40 p. m. an auroral beam of a light straw color, about 2° in width, and which remained visible for about fifteen minutes, extended from the eastern to the western horizon, passing 20° south of the zenith. At 12, midnight, a perfect corona was formed. The auroral light extended to the horizon in the south and southwest and, with the exception of some shooting beams, that in the north disappeared. The color of all shooting beams as they reached the zenith from every direction changed to salmon, and made a most brilliant display. 20th, aurora of previous day ended at 4 a. m.

Knoxville, Tenn.—20th, a. m., just after midnight, and directly after a rain that had been falling for half an hour, a red light of large extent in the north. As the black clouds moved toward the northeast the red cloud moved also. The display interfered with the telegraph wires to a considerable extent.

Lander, Wyo.—20th, at six o'clock this morning an aurora was observed, which, had it not been for the bright moonlight, would have been a magnificent display. The northern sky was covered with immense streamers of light, some of pale pink color reaching up to and beyond the zenith, where they were lost in the moon's rays. The display must have commenced about 12, midnight, and continued until about daylight, or 7 a. m.

Miles City, Mont.—20th, aurora became visible at 12.02 a. m. At first it was a pale arch, about 30° azimuth and 15° altitude, with dark background, the whole phenomenon being in the north. At 1 a. m. pale "merry dancers" appeared, shooting upward and moving across the sky to the southern horizon. At 1.30 a. m. the arch and background which was previously seen in the north was exactly reproduced in the south. It disappeared at the oncoming of daylight.

Rapid City, S. Dak.—19th, at 10.50 p. m. an aurora observed; azimuth, 110° to 240°; arch nearly to zenith. At 10.58 a second arch appeared, with interspace of sky, developed from west to east, varying in width, average about 10°, and color whitish to rose. 20th, aurora at 12.15 a. m. Streamers dimly seen through haze. Reliable persons state grand display at 5 a. m.

Red Bluff, Cal.—20th, fine auroral display observed in the north from 2 a. m. to 5.15 a. m. When first observed, the aurora appeared as bars of varied colored light, extending from below the horizon upward to within 22° of the zenith, and had an azimuth distance of from north to 25° east. At 4.10 p. m. the above form disappeared and in its place, but a few degrees to the east, appeared a wide blotch of red. This gradually died away and by 5.15 a. m. had entirely disappeared.

Sacramento, Cal.—20th, auroral light from 1 a. m. to 4 a. m., consisting of a diffused reddish tinge, with an occasional stream shooting upward to an angle of 45°.

Salt Lake City, Utah.—19th, a faint aurora was observed from 10.50 p. m. to 11.30 p. m. It began with a reddish glow, azimuth 145° to 175°, and white light, azimuth 175° to 200°; at 11.15 p. m. a dark cloud-like haze spread out between azimuths 190° to 140°, and soon a dark segment was formed, altitude 15°. Above this was a changing glow some 5° to 10° in width, in color varying from yellow to deep green. Faded away after 11.25 p. m. A few faint streamers, very fitful, were observed. At the closing stage of the aurora parallel bands of cirro-cumulus clouds extended from north far toward south across the sky.

Spokane, Wash.—20th, an aurora was observed at 2 a. m.; parallel beams which seemed converge near the zenith, and had a slightly tremulous motion; the aurora was extremely brilliant at 5 a. m., and had disappeared by 6 a. m.

Walla Walla, Wash.—20th, auroral clouds observed at 12.17 a. m.; disappeared at 12.48 a. m.; altitude 50°; azimuth 270°. Color pale resembling a cirrus cloud; shape of a feather with the butt end toward the north and pointing southwest.

Williston, N. Dak.—19th, aurora or corona observed at 10.45 p. m., extending entirely across the horizon from north to south and converging to a point a little south of the zenith, forming a quivering mass of flame. It was most brilliant at 11.45 p. m., and continued visible until after midnight. The prevailing colors were a pale yellowish white and dull pink. 20th, the aurora from night previous became faint and disappeared at 1.30 a. m. Previous to its disappearance it formed one arch of about 145°, very brilliant and bright red and yellow colors. The moon, during the auroral display, was most brilliant.

Winnemucca, Nev.—19th, 10.45 p. m., aurora from northwest to northeast, arch 25° high, on horizon small segment of haze, then pale green, 10° high, upper part patches of pink changing from one place to another. Moon rose above the mountains 11.45 p. m. After the moon rose the pale green became very bright; patches of bright, pale green would pass from northwest to northeast in place of the pink at top of arch, which had a hazy appearance. 20th, the very bright, pale green to top of arch 30°. Hazy segment underneath increasing to 15°. Both gradually rising. Night watchman states the light of the aurora was overhead at 3 a. m. in horizon from points in west to southeast. Continued until daylight.

SMOKE FROM FOREST FIRES.

The extensive fires during July and August, principally in Minnesota, Wisconsin, Michigan, Pennsylvania, and New York, and the absence of extensive strong winds, have conspired to cover a large portion of the country with an unusually thick cloud of smoke. The loss of property and life need not here be dwelt upon, but the following considerations relative to the meteorological phenomena are appropriate to this REVIEW.

Atmospheric moisture.—The burning of the forest covering over any area is equivalent to the abnormal addition to the atmosphere of the moisture that is otherwise locked up in the forest and the soil, and this may be estimated on the average as equivalent to a layer of water or rainfall of one-quarter of an inch over the whole burnt area. As this moisture is not likely to fall on or near the region of the fire, but is diffused over a much larger area, its total effect in increasing the depth of rainfall at any place is inappreciable and its effect in increasing the general quantity of rainfall is too slight to be of any importance. The experience of this summer is sufficient to show that the forest fires are not necessarily followed by rain and are not a practicable method of inducing rain in dry seasons.

Atmospheric heat.—The entire consumption of the forest covering adds an abnormal amount of heat to the atmosphere. The burning of a pound of green forest wood evolves a quantity of heat that is estimated to be sufficient to warm up 4,600 pounds of water, or 18,500 pounds of air, by 1° F.; this is about the weight of ordinary air near the ground contained within a cube 60 feet on each side. But a cube of atmosphere of this size within an ordinary forest area may be estimated to contain 10,000 pounds of heavy and light wood, omitting the thicker timber and branches that do not burn in a forest fire. Therefore, the rapid burning of the lighter material in a forest area gives out heat enough to warm the forest air within 60 feet of the ground by 10,000°. This warmth, of course, is the cause of the rapidly ascending streams of hot air and smoke, so that fresh supplies of cooler air come in to share the heat, and the general result is that a volume of air many times larger than the original layer is warmed to a correspondingly less extent. The heat thus carried up into the atmosphere is rapidly diffused and eventually lost by radiation into space. The clouds of warm smoke that are carried away by the wind radiate a little warmth downward to the earth's surface, but scarcely sufficient to appreciably raise the temperature. The immense work directly done by this abnormal heat consists mostly in expanding the original air over the forest; as this expanded air rises other dry air comes down and the general result of the process is that an abnormal amount of topsy-turvy movement, or vertical circulation of air, is produced over and above that due to the heat of normal sunshine.

The quantity of heat from sunshine received by a horizontal area at latitude N. 45° on the 20th of June, after allowing for the absorption of the heat by the atmosphere, can be computed from the data given by Angot in his Theoretical Researches on the Distribution of Heat at the Surface of the Globe. If the so-called solar constant is, as given by Violle, 2.54 calories per square centimeter per minute, and if the coefficient of atmospheric absorption be 0.7, then during the sunshine of one day at the summer solstice at latitude N. 40°, the heat that reaches the earth's surface is $0.660\times1,164.25=768$ calories per square centimeter. This is, therefore, sufficient to warm by 1° C. a layer of water that is 768 centimeters in depth; expressed in English measures, it will warm by 1° F. a layer that is 169 inches deep. For latitude N. 45° this becomes 165 inches, and for latitude N. 50°, 161 inches, or on the average for the northern portion of the United States about 14 feet in depth of water. This depth in water may be converted into depth of air by considering the density of air (0.0012759) and the specific heat of air relative to water (0.2375). The resulting factor is about 3145, whence it follows that a layer of air about 45,000 feet in depth would be warmed up 1° F. by the action of all the heat received, during the 20th or 21st of June, at any point in latitude N. 45°; or, in other words, a layer of air 60 feet in depth would be warmed up 750°. Comparing this normal maximum effect of solar heat with the previous computation of the effect of burning forest, we see that in the locality where it occurs a forest fire can heat its atmosphere more than the hottest sun of June in the ratio of 10,000 to 750. Fortunately, however, the general influence of the forest fire upon the whole atmosphere is much smaller than that of the sun, because the fire is of small extent, while the sun affects the whole earth.

The actual area covered by the forest fires of August in Minnesota, Wisconsin, and Michigan did not, so far as we have received reports, exceed 5,000 square miles, whereas the area covered by the smoke, and, therefore, hot air, from these fires before the heat was all lost by radiation was not less than 1,000,000 square miles. Consequently, if we compare the solar effect over this large area and the more intense forest fire effect over the small area, we shall find that they are in the ratio of 750,000,000 to 50,000,000, or the solar effect is fifteen times that of fire.

Although it would seem that we have thus belittled the meteorological importance of the forest fire, yet this is far from being true. The equivalent of 6 per cent of the heat received over a large portion of the United States from the sun on the hottest day of the year was, in the course of a few weeks, suddenly returned to the atmosphere by a series of local fires; possibly 1 per cent of the moisture normally evaporated was also similarly returned. As these clouds of smoke and moisture floated away, the sunshine that would normally fall upon the earth's surface was absorbed by them in the upper layers of the atmosphere. The final result was, therefore, to diminish the midday temperature of the air at the earth's surface and to increase its temperature in a higher stratum. But the extra heat is eventually lost by radiation, and the only effects that endure for several weeks are the greater quantities of moisture and smoke or dust left in the atmosphere and the general disturbance of atmospheric motions, due to the original intense topsy-turvy movements.

A number of stations have reported that the occurrence of frost has been prevented by the overhanging clouds of smoke, and many stations seem to have experienced less heat at midday and less cold at nighttime, owing to this protective covering, whose influence is therefore seen not so much in the average temperatures of the month as in the maxima and minima and the diurnal ranges. The dates on which smoke or smoky haze was especially noted at numerous stations in the respective States are as follows:

Colorado, 22d–30th; Connecticut, 23d–31st; Delaware, 21st; Idaho, 18th–31st; Illinois, 17th–31st; Indiana, 26th–31st; Iowa, 18th–31st; Kansas, 22d–31st; Kentucky, 21–31st; Louisiana, 23d–28th; Maine, 23d–28th; Maryland, 21–31st; Massachusetts, 23d–31st; Michigan, 14th–31st; Minnesota, 20th–31st; Missouri, 21–31st; Nebraska, 18th–31st; Nevada, 21–31st; New Mexico, 20–26th; New York, 21st–28th; North Carolina, 23d–30th; North Dakota, 13–28th; Ohio, 13–28th; Oregon, 13–28th; Pennsylvania, 20–30th; South Carolina, 23d–30th; South Dakota, 20–29th; Tennessee, 28th; Texas, 24–25th; Utah, 21–26th; Vermont, 21st; Virginia, 27th–31st; Washington, 20–30th; West Virginia, 24–28th; Wisconsin, 9–29th; Wyoming, 23d–26th.

The following notes with regard to smoke at special stations are taken from the published reports of the State Weather Services:

Minnesota.—New Ulm, latter half of month. Clear Water, the whole month. Medford, 9th. Airlie, 20th–21st. Sunrise City, most of the month. Carver, sun not seen for many days. Clear Lake, 20th and 29th. Crookston, 29th. Belle Plaine, 6th and 7th, 27th and 28th. Rolling Green, 23d–31st. Granite Falls, about half the month. Campbell, at the end of the month.

New Jersey.—Oceanic, last five days of the month. Dover, last week of the month very hazy. Bayonne, 26th to 31st, especially on the 30th. Millville, 29th to 31st to the north of this station.

North Dakota.—Berlin, last half of the month.

West Virginia.—Over almost the entire State from the 28th to the close of the month.

Wisconsin.—Royalton, most of the month. Oconomowoc, 25th–31st. Medford, dense smoke for several weeks. Fond du Lac, during all the month. Black River Falls, 9th.

The gradual spread of the smoke or haze can not be clearly deduced from the indefinite reports at hand.

THE POSSIBILITIES OF LONG-RANGE FORECASTS.

If we had perfect command of this subject, we should be able to trace the motion of a particle of aqueous vapor from point to point over the whole earth and could predict whether at any time in the future it will fall as rain or rise and fly away as an invisible gas. In the absence of this higher knowledge the only long-range forecasts that we are at present able to make are based upon empirical and very imperfect rules deduced from our study of the accumulated climatological statistics. Of course, such predictions do not imply any special knowledge of meteorology. Among the methods adopted in long-range forecasts are the following:

A.—The average rainfall, temperature, etc., for any period, such as a month, and deduced from many years of observation, is called the normal. The excess or deficiency of this month in any given year is called the departure for that year. A general prediction may be made to the effect that the rainfall for a given month and place may be expected to lie within the range of the values indicated by these known departures.

B.—The series of annual or monthly values just mentioned gives us the means of finding out whether there is any simple sequence or connection between them and the apparently unconnected values that occur from year to year. Thus, it sometimes happens that rainy seasons come after two or three dry seasons, or that after the same month has been dry in three successive years one is then justified in predicting a wet month. Thus, Governor Rawson elaborated a system for the prediction of rain and the sugar crop in Barbados.

C.—Slight but appreciable widespread, rather regular fluctuations of temperature, pressure, and rain have been revealed in the climate of Europe by Dr. Brückner, who finds that a deficient temperature and an excess of rain have alternated with excess of temperature and deficiency of rain in periods of thirty-six or thirty-seven years during the past two or three centuries; the glaciers increase and diminish in volume, or advance and retreat, in correspondingly regular but somewhat retarded intervals. Predictions may be based on these well-established periods.

D.—Droughts are sometimes due to what happens in distant regions; thus, if there is a heavy snow on the Himalayas during the winter there is a special liability to drought in lower India in the following summer, so that the prediction of a drought may be based upon the reports of snowfall in a distant region several months before the drought occurs; but other droughts may occur without this preliminary snowfall. This connection is, so far as at present known, a local, arbitrary, or accidental one, and has not yet been found to recur in any other portion of the globe.

E.—Droughts or floods may occur every year in some portion of an extensive region, so that it may become possible to predict the occurrence in a special section one year because one has occurred in another section a previous year. Thus, a serious drought in the lower Indian peninsula has, on five occasions, been followed by one in northern India the next year.

F.—If we had maps of the weather of the whole globe for every month for a long series of years we should, undoubtedly, be able to find many similar coincidences so that a drought for a given section might be predicted from the rainfall, the snowfall, the temperature, the pressure, or other conditions in a distant part of the globe. As a rule, important climatic crises are the results of changes that have been going on slowly for a long time in distant parts of the earth. The general circulation of the air constitutes a complex system in which the areas of hish pressure and dry clear air are the results of slowly descending winds moving toward the equator; the general rains are formed wherever a descending current of air, a mountain range, or other obstacle has an opportunity to push up the moister air of the earth's surface. From this point of view rainy and dry and cold and hot seasons depend largely upon the varying relations of the upper and lower currents to the continents and even to each other. The long-range prediction of the climate of any season must depend upon the prediction of the general character of the horizontal and vertical movement of the air. In our present geological epoch the continents are permanent features, and we consider only the changes that take place in the atmosphere, but in studying the climatic changes of earlier geological epochs we have to consider the changes in elevation of the continents themselves.

G.—Such apparent connections as that between snowfall on the Himalayas and the subsequent drought in northern India are not to be thought of as cause and effect respectively. It might be argued that the layer of snow must be evaporated, or melted, thereby absorbing more heat than would have been required if it had fallen as rain and rapidly drained away; but this cooling influence is distributed over many weeks and through the immense quantity of air that has passed over the snow fields during the winter and spring, and is thereby rendered too slight to have any great local influence in India. A broader view of the subject shows us that the winter snowfall and the summer drought are simply two features of an extensive system of changes in which the whole atmosphere of the earth takes part. The whole globe may be divided into regions where the lower stratum is moving either horizontally, or upward or downward, and where the upper stratum has similar diversities of movement. These systems of motion determine whether we shall have fair weather or rain, hot weather or cold, from day to day and accumulatively from month to month. Now these three movements are related to each other in such a way that the sum total of the energy involved throughout the atmosphere is sensibly constant, while the localities at which the upward and downward motions are taking place are undergoing perpetual changes.

The centers of high pressure over the oceans and continents slowly sway east and west or north and south; the paths of the storm centers vary in a similar manner to suit the changes of these larger areas and the centers themselves move rapidly or slowly in response to these same changes. The air that ascends between the northern and southern tropical, regions of high pressure descends sometimes in high latitudes giving them cold weather with rain or snow; at other times in low latitudes, giving them warm weather with droughts. It matters not whether the droughts in southern regions chronologically follow or precede the snows of the northern regions; in neither case can either one be spoken of as the cause of the other, but each is in its turn the result of changes in the so-called general circulation of the atmosphere.

This general circulation with all its variations, diurnal, annual, and secular, is dependent upon the intrinsic density of each portion of the atmosphere and on numerous forces, such as the heat received from the sun, the attraction of the sun, moon, and earth, the resistance offered by the irregular surface or the earth, and the interaction of slow and rapidly moving masses of air. The proper study of this subject constitutes the application of hydrodynamics to meteorology.

The meteorological problem has some analogy to that offered by the hydraulics of the Mississippi River, where cut-offs, cave-ins, mud banks, and crevasses are continually forming and reforming. We do not expect to be able to foretell when and where these will occur many years in advance, but we do keep a watch on the condition of the river, and when conditions are favorable for the formation of any important change we watch the process until the catastrophe becomes more or less imminent, and then begin to make estimates that may be called predictions, as to the exact time and place of the event.

In meteorology the best we can do at present in long-range predictions is to chart and study the occurrence of abnormal weather conditions over the whole globe; these phenomena must be interpreted in the light of all the knowledge we have of the mechanics of the atmosphere, for they are the results of purely mechanical operations covering the whole range of the mechanics of heat, gases, and vapors.

DEATH OF MAJ. J. W. A. WRIGHT, OF ALABAMA.

Maj. James William Albert Wright, for many years voluntary observer of the Signal Service and Weather Bureau, died at his station, Talladega, Ala., on August 11, 1894. Major Wright will be remembered as the successor of the late Prof. Henry Tutweiler, Smithsonian and Signal Service observer at Greene Springs, Hale Co., Ala. The work of these two observers covers a period of over forty years, and has given to central Alabama a fund of climatological data that will be a standard of reference for many years to come. The results of their labors were collected and published by Major Wright in 1888, as No. 5 of a series of Special Papers of the Alabama State Weather Service.

Major Wright always took an active part in the meteorological work of his State; his cheerful and hearty co-operation in all matters pertaining to the State or National service was a source of pleasure to those associated with him.—A. J. H.

METEOROLOGICAL TABLES.

[*Prepared by the Division of Records and Meteorological Data.*]

The following pages present in tabular form the climatological data for the current month, on which the text of the preceding part of this Review has, to a large extent, been based.

For a detailed description of the methods of observation, compilation, and computation relating to these tables, the reader is referred to page 129 of the Monthly Weather Review for March, 1894. The general contents of the tables are as follows:

Table I gives for 140 Weather Bureau stations, making two observations daily, and for 10 others making only one observation, the ordinary climatological data.

Table II gives for about 2,200 stations, occupied by voluntary observers, the mean and extreme temperatures and the total precipitation.

Table III gives climatological data for about 30 Canadian stations.

Table IV *a* gives for 38 Weather Bureau stations the percentages of sunshine for each hour of local mean time.

Table IV *b* gives for 43 Weather Bureau stations the total hourly rainfall for each hour of seventy-fifth meridian time.

Table V gives for 81 stations the mean temperatures for each hour of seventy-fifth meridian time.

Table VI gives for 66 stations the mean pressures for each hour of seventy-fifth meridian time.

Table VII gives for 138 stations the mean hourly movement of the wind.

Table VIII gives for 68 stations the resultant movements and directions of the wind from continuous registrations.

Table IX gives for 140 stations the component and resultant directions of the wind based on simultaneous observations at 8 a. m. and 8 p. m., seventy-fifth meridian time.

Table X *a* gives for 47 voluntary stations the normals and current departures of mean monthly temperatures.

Table X *b* gives for the same stations the similar data as to precipitation.

Table XI gives for each day of the month the number of thunderstorms (T), and of auroras (A), reported by all the observers of each State.

Table XII gives the principal climatic features of the month as reported by each State weather service.